USFS Airborne Imaging Technology

Federal Fire Working Group

June 20, 2013

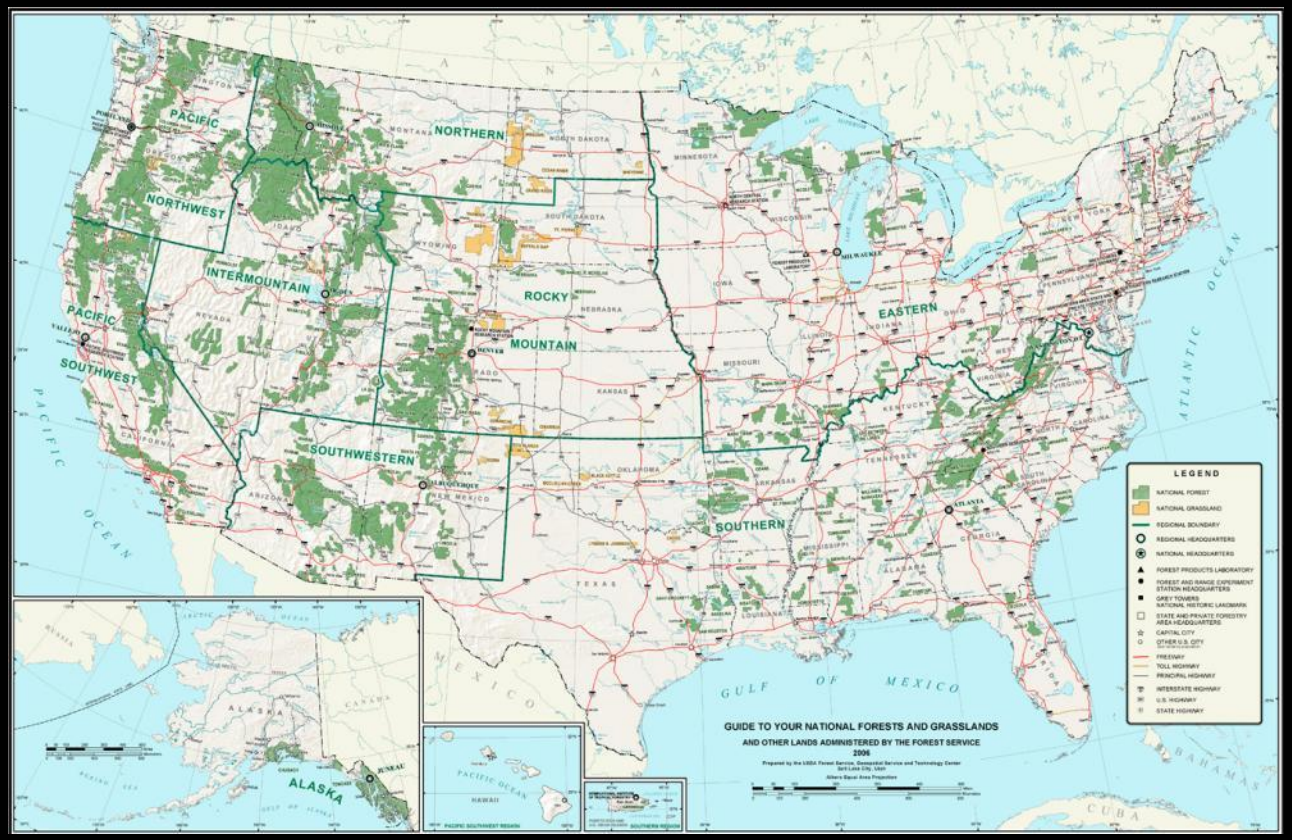
Everett Hinkley

National Remote Sensing Program Manager - Forest Service

USDA Forest Service Organization

- National Headquarters in Washington, DC
- 9 Regional Offices
- National Forest System
  - 155 National Forests and 20 National Grasslands
  - 78 million hectares in CONUS, AK and PR

- Research
  - 7 stations
  - 50 field offices
- State and Private Forestry
  - Fire & Aviation
  - Forest Health Protection
- International Programs

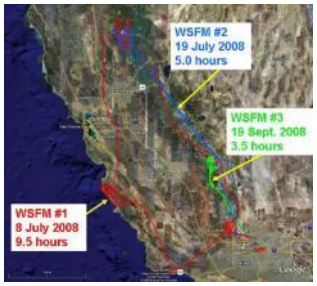


Forest Service Aviation

- Owns and operates 24 aircraft and helicopters
- Contracts with over 800 aircraft and helicopters annually
- Missions Include:
  - Fire surveillance
  - Aerial reconnaissance
  - Air Attack
  - Delivery of smoke jumpers
  - Firefighter and cargo transport
  - Aerial delivery of retardant and water
  - Natural resource management
  - Research

AMS Transfer to Operations Timeline

AMS integrated on Altair; flies Esperanza Fire, Oct 2006

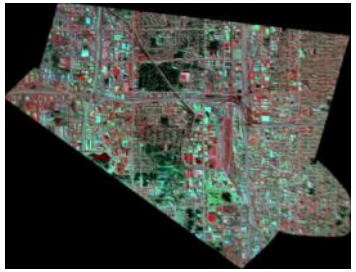


AMS flies No. CA Lightning Storm Wildfires, Summer 2008

AMS flies Station Fire Post-Fire Assessment, Nov 2009

AMS Integrated on NASA B200 KA, December 2010

First Test Flight Data From AMS on Citation, March 2013



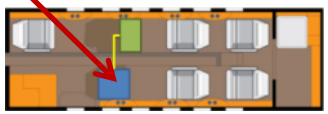
2006 2007 2008 2009 2010 2011 2012 2013

AMS integrated on Ikhana; flies four Western States Fire Missions covering eight states and +20 fires, summer 2007

AMS flies So. CA Firestorm missions; Oct. 2007

AMS flies Los Conches NM Wildfire & 2 So. CA Wildfires

AMS Integrated on USFS Citation jet



NASA-USFS Transfer Workshop 4/18/13

FS Cessna Citation (N144Z) at NASA Ames Research Center

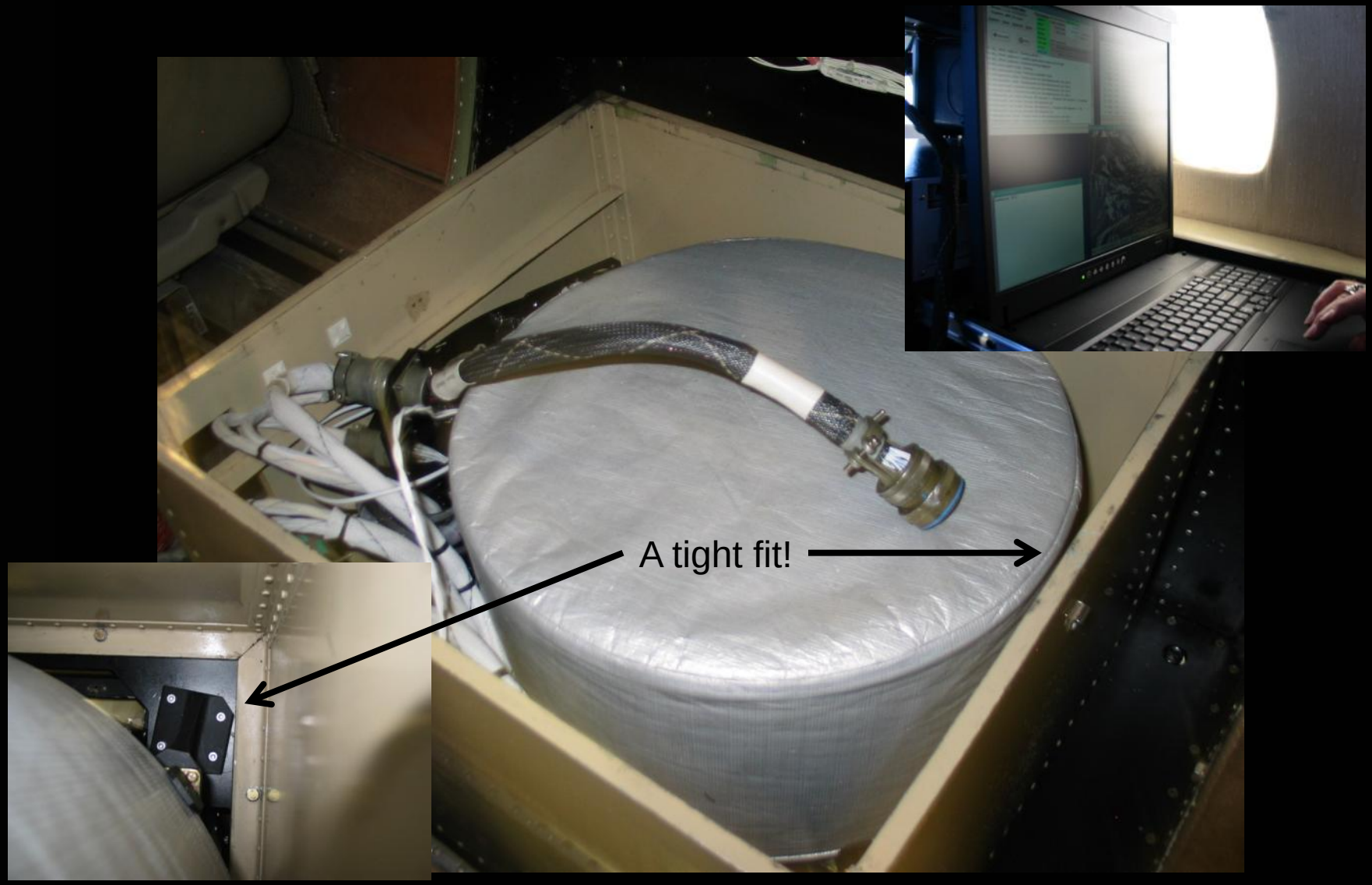
N144Z Specifications

- **Cessna Citation Bravo**
  - Primary Mission – Infrared Fire Mapping (April – October)
- **AirCell Datalink**
  - Average 204 Kbs downlink
  - Continuous coverage CONUS at 10,000 AGL
- **Sensor Bay**
  - Port Side blister
  - Opening 18 in long 15 wide
  - Sensor bay 24 in long 17 wide

144Z Specification

- Cruse Speed 380 kts
- Max Altitude 45,000 ft
- Min Safe Airspeed 120 kts
- Endurance 4-5 hours
- Flight Rate $1960 per hour
- Installation and engineering costs were low.

144Z AMS Installation



Data Products

- Daytime Fire with hotspot detection
- Night time hotspot detection
- Burned Area Emergency Rehabilitation (BAER)
- Fire Radioactive Power (FRP)
- Color Infrared (CIR)
- Customized Products

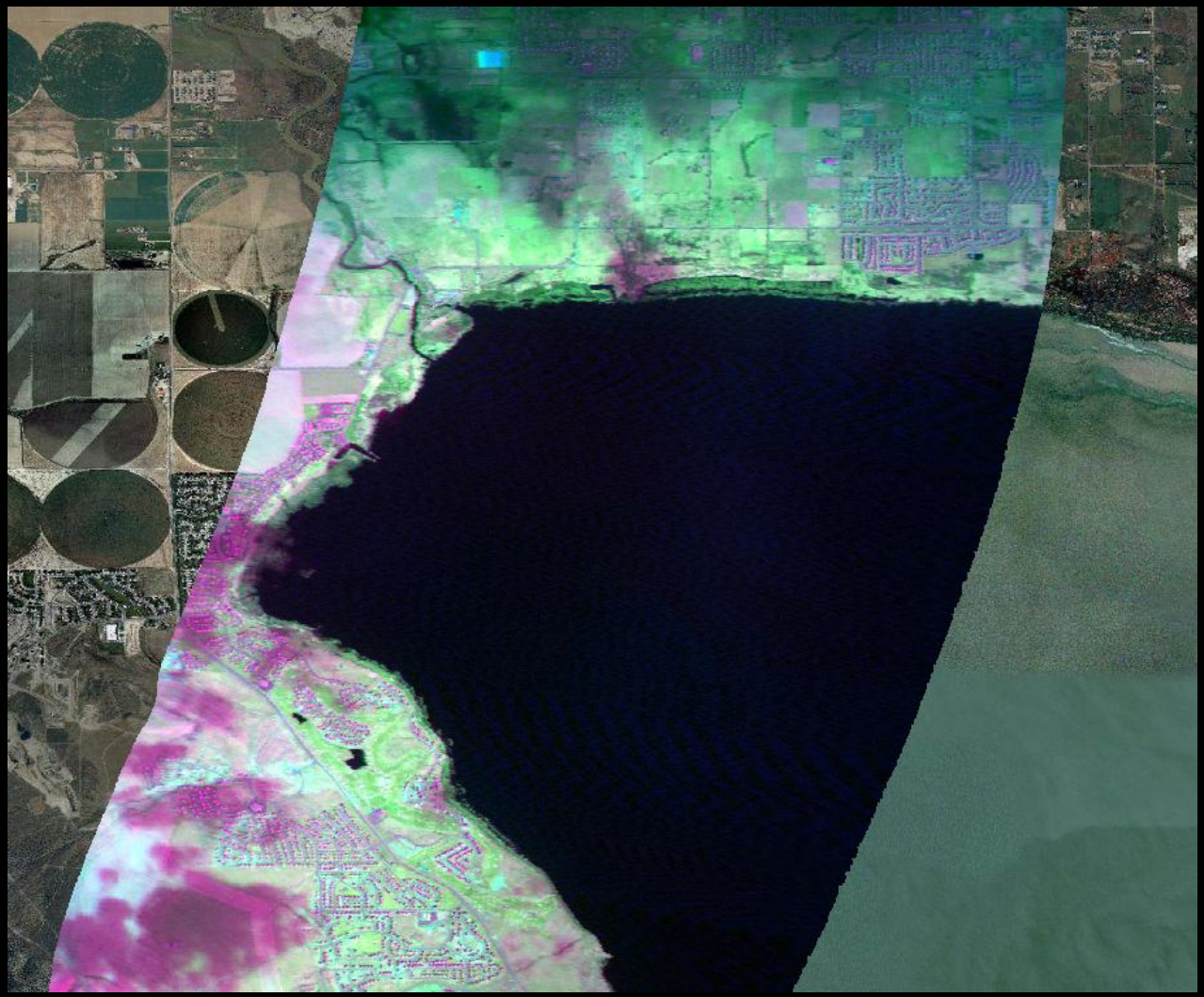
Data Distribution

- Fire Support
  - Coordinated through NICC and NIROPS
  - Ordering through NIROPS
  - Distribution through NIFC FTP
- Non Fire Support / Reimbursable Projects
  - Order through RSAC
  - 16 Channel Data sent to RSAC/Ames for preprocessing.
  - Distribution the FS AMS website http://nirops.fs.fed.us/ams

Completed and Proposed Mission

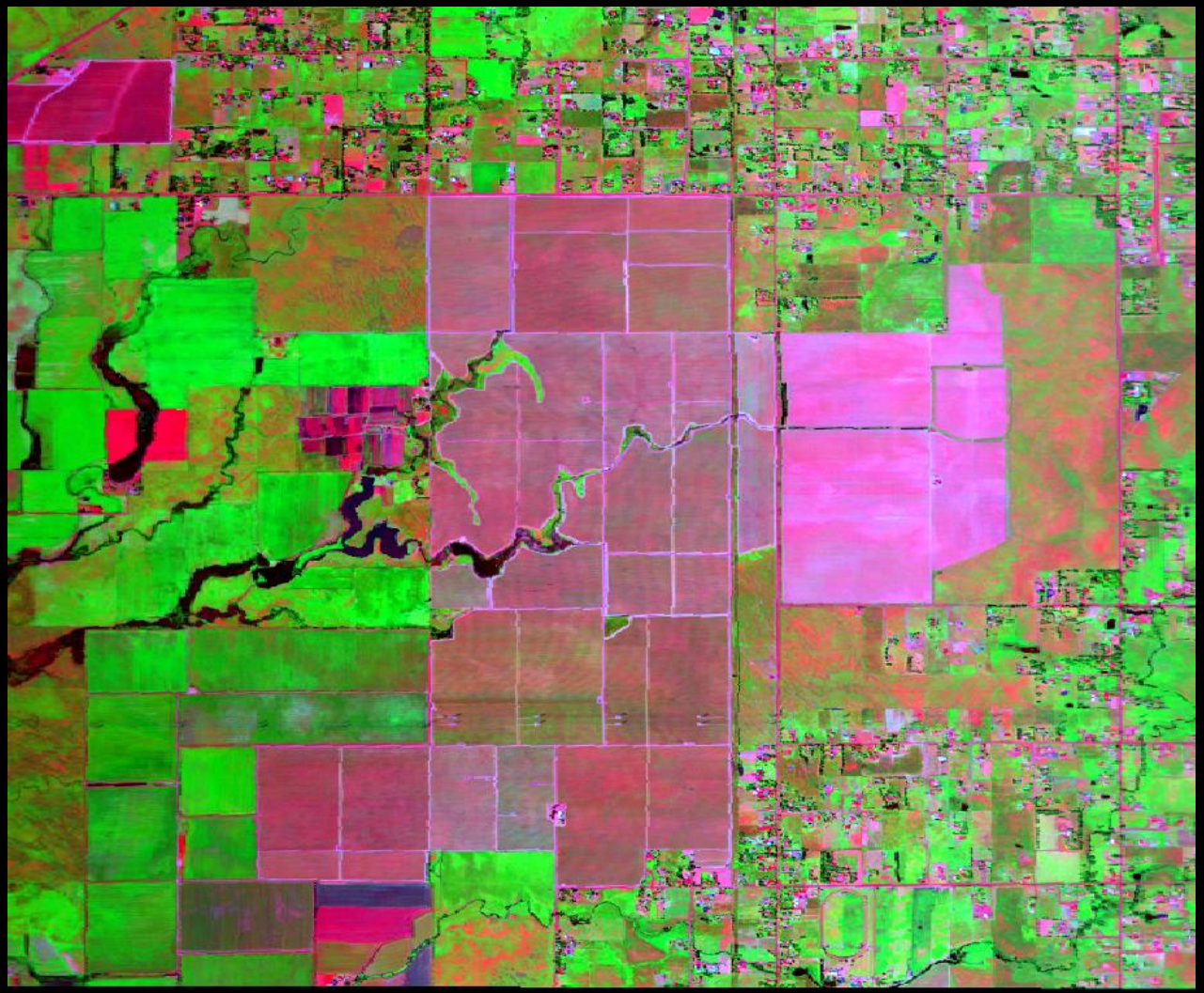
- USGS – Hot Spring, Utah Lake
- USDA – Vineyards, California
- NASA – IPM Testing
- AMS/WAI/Phoenix Concurrent Fire Imaging
- Daytime Fire Imaging
- BAER Support
- AFUE – Aerial Firefighting and Effectiveness Study
- Forest Health Protection – Invasive Species
- Post Storm Assessment
- Satellite Calibration Validation – VIIRS
- Reimbursable projects

USGS – Utah Lake, Hot Springs



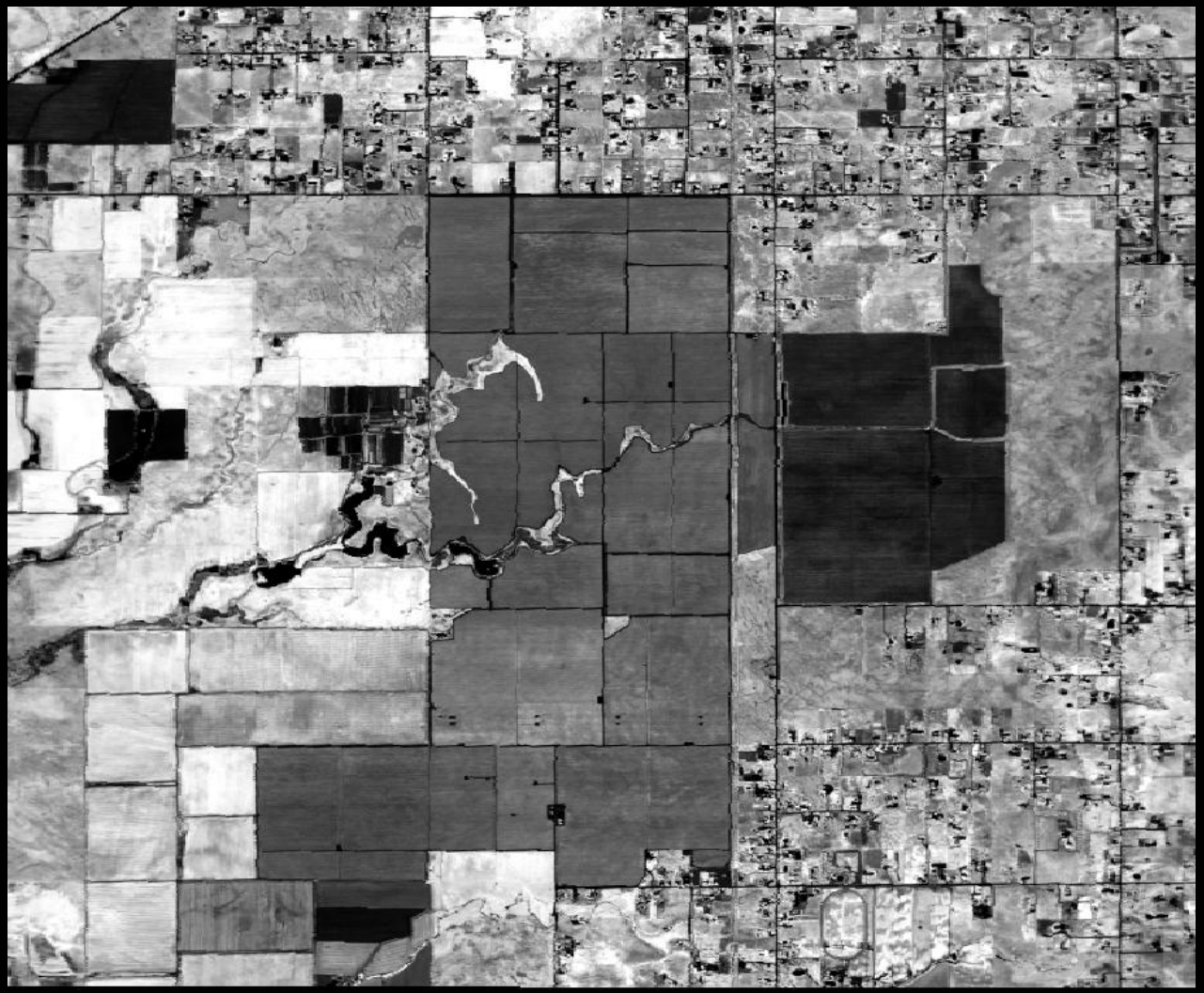
AMS Band 12, 9, 11

USDA – Vineyards, Evapo-transporation



AMS Band 12, 7, 5

USDA – Vineyards, Evapo-transporation



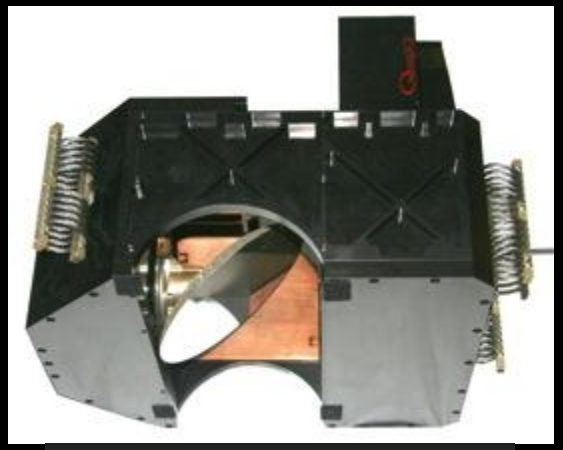
AMS NDVI

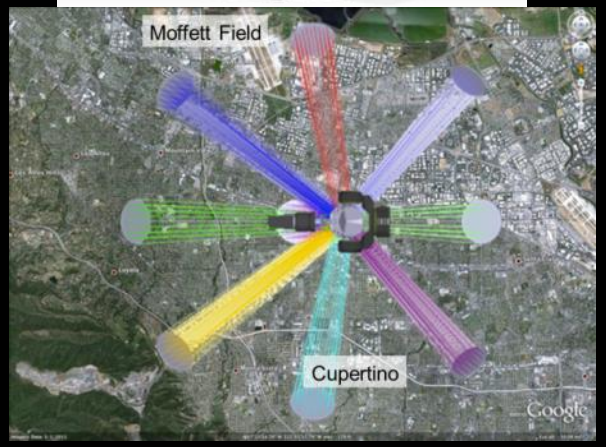
Future Possibilities

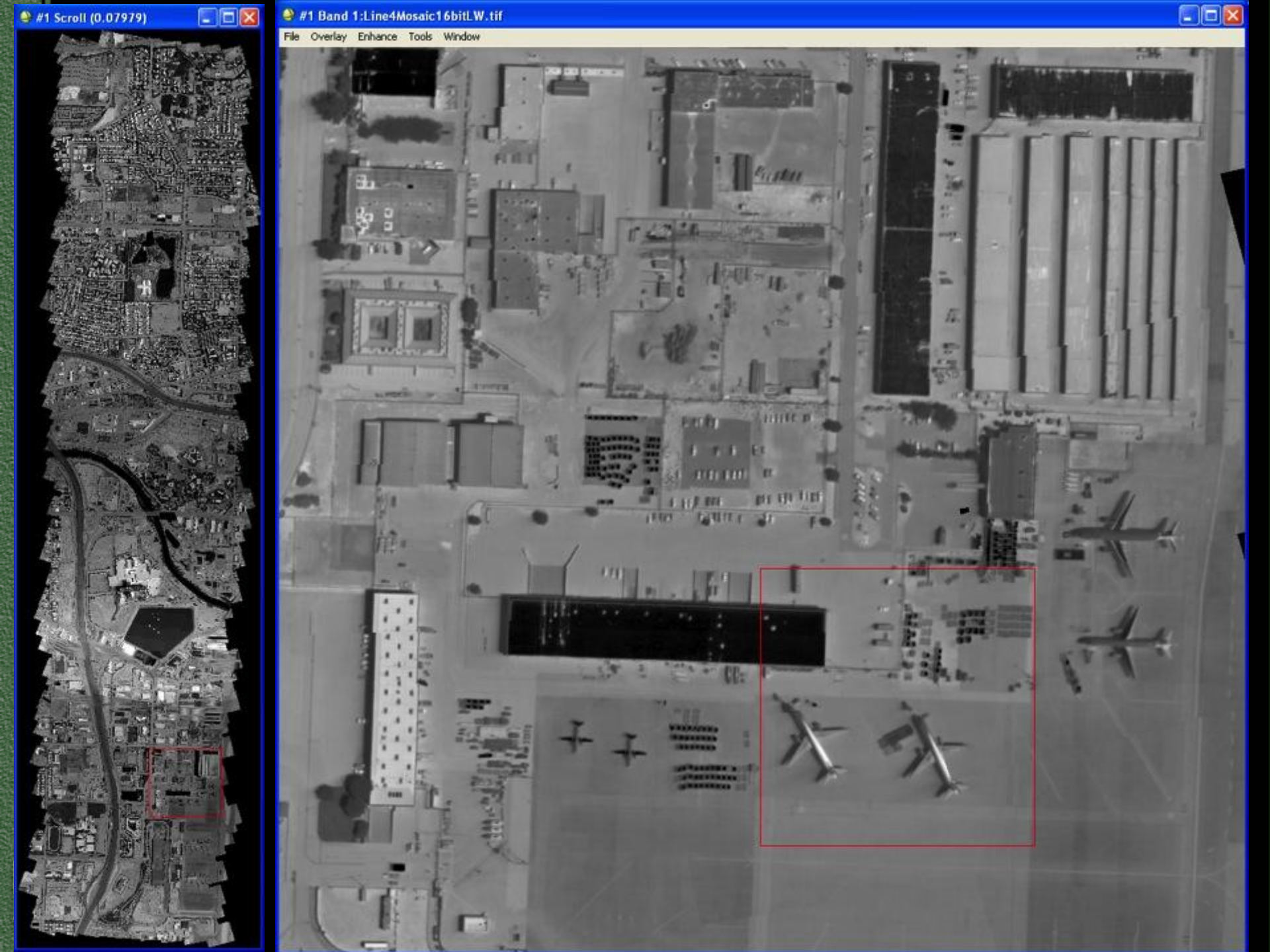
- Use AMS on 144Z in off season
- Surge Aircraft - TBD
  - Cover scheduled and non scheduled maintenance for NIROPS
  - Support Incidents in times of very heavy activity
  - Support non-fire imagery missions, reimbursable projects with AMS or other available sensors (WAI, StareWAI, etc)
  - New Sensor Testing

Future Sensors

- Wide Area Imager
  - 5 Band CIR-LWIR
  - 0.6 milliradian IFOV
  - NASA SBIR with USFS Phase 3 funding
- Stare Wide Area Imager
  - 2 Band LWIR
  - 60 second revisit time trough FOV
  - USFS SBIR






#1 Scroll (0.07979)
#1 Band 1:Line4Mosaic16bitLW.tif
File
Overlay
Enhance
Tools
Window

FS Aircraft with RS Capabilities

- As with 144Z aircraft are usually busy from April – September.
  - Sensors that do not interfere with mission can usually be flown.
- Beechcraft B200 King Air
- Bell AH-1F (Huey Cobra)
- Cessna 206 Stationair
- De Havilland DCH-2 Beaver
- De Havilland DCH-6 Twin Otter

USFS Future Fleet

- Fire and Aviation Management is currently analyzing the size and composition of the USFS aviation fleet.
- UAS are being evaluated as possible platforms for some missions.

Thank you!
Questions?